

EFFECT OF GNRH AGONIST AT DIFFERENT STAGES OF THE PGF_{2α} INDUCED ESTROUS CYCLE IN REPEAT BREEDER COWS

K.KRISHNAKUMAR¹ AND C.CHANDRAHASAN²

Department of Animal Reproduction, Gynaecology and Obstetrics, Veterinary College and Research Institute, Namakkal, Tamilnadu, India -637 002

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ABSTRACT

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Forty repeat breeder cows were randomly allotted into four groups and were induced to estrus with 25mg of PGF_{2α}, intramuscularly on day 10 of the estrous cycle. After estrus induction, group I was not given any treatment. Cows of group II, III and IV were treated with 20µg of GnRH agonist, intramuscularly at 48 and 72 h after PGF_{2α} administration and day 5 post insemination respectively. Breeding was done with good quality frozen semen for all the groups at 72 and 96 h after PGF_{2α} administration. The time taken for the onset of estrus and duration of estrus in group II was shorter ($P < 0.01$) than the other groups. The incidence of weak estrus was significantly higher in group II while the incidence of intense and intermediate estrus was significantly higher in group III when compared with other groups. The group IV had significantly longer oestrous cycle length ($P < 0.01$) than the other groups. The serum progesterone concentration did not differ significantly ($P > 0.05$) on day 0 in any of the groups, but was significantly higher ($P < 0.05$) in group II at 72 h after PGF_{2α} injection, in group III on day 5, and in group IV on day 10 and 16 post insemination. The conception rate in the first service was higher in group III, the second service and overall conception rate was higher in group IV. It can be inferred from the present study that PGF_{2α} synchronized estrus combined with GnRH 72h after PGF_{2α} administration and on day 5 post-insemination were found to have achieved fairly a good overall conception rate in repeat breeder cows.

Key words: Repeat breeding, Induced estrus, GnRH, PGF_{2α} Conception rate

INTRODUCTION

Repeat breeding in dairy cattle is a main detrimental cause of optimal breeding efficiency that affects the economy of the dairy farms. The incidence of such problem has been reported to be 10-25 per cent in exotic as well as Indian breeds (Sharma *et al.*, 1988). A need for adequate concentration of progesterone in early pregnancy is well established and insufficiency of progesterone has been implicated as a cause for abnormal development of embryos and early embryonic death (Maurer and Echternkamp, 1985). The lowered

conception rate with PGF_{2α} was related to reduced corpus luteum weight and subsequent lower serum progesterone concentration (Rentfrow *et al.*, 1987). Therefore, alternate measures were made to enhance fertility in repeat breeding dairy cows with GnRH agonist administration at various times before and after insemination in PGF_{2α} induced estrus to enhance corpus luteum function and pregnancy rate.

MATERIALS AND METHODS

The crossbred cows brought at the Gynaecology unit, Veterinary College and Research Institute Hospital, Namakkal, Tamilnadu Veterinary and Animal Sciences University were utilized for this study. Forty healthy, parous, cyclic, well maintained crossbred cows under ten years of age with no palpable or visible abnormalities in their genital tract and had failed to conceive for three consecutive insemination with good quality semen were

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Present Address: ¹Professor and Head, Department of Clinics, VC&RI, Orathanadu-614625 and²

Controller of Examinations, TANUVAS, Chennai-600051

the basis for inclusion in this study. Forty repeat breeder cows were randomly allotted into four groups and were induced to estrus with 25mg of PGF_{2α} intramuscularly on day 10 of the estrous cycle. After estrus induction, group I was not given any treatment. Cows of Group II, III and IV were treated with 20µg of GnRH agonist, intramuscularly at 48 and 72 h after PGF_{2α} administration and on day 5 post - insemination, respectively. Breeding was done with good quality frozen thawed semen for all the groups at 72 and 96 h after PGF_{2α} administration. The percentage of respondent, onset, duration and intensity of estrus, conception rate and length of estrus cycle in non-conceived cows were studied. The blood samples were collected on days 0 (at the time of PGF_{2α} administration), 5, 10 and 16 post insemination. The serum was separated and stored at -20°C until assayed

for progesterone using solid phase radio immune assay technique. The data were statistically analyzed as per the method of Snedecor and Cochran(1989).

RESULTS AND DISCUSSION

The post-treatment estrus response in the present study was 100 per cent as all the treated cows exhibited estrus. The post-treatment estrus response in this study was higher, in contrast to the observations made by Patil and Pawshe (2011), who found estrus response only in 62.5 percent of cows with 25 mg of Dinoprost tromethamine, intramuscularly in the luteal phase of the cycle. The possible reason for the higher percentage of cows exhibiting estrus might be due to the corpus luteum becomes more sensitive to the luteolytic effect of PGF_{2α} as the stage of the cycle advances.

TABLE 1. MEAN ± SE FOR ONSET, DURATION AND INTENSITY OF ESTRUS AND LENGTH OF ESTROUS CYCLE WITH DIFFERENT TREATMENT REGIMENS IN REPEAT BREEDING COWS

Group	Treatment	Onset of estrus (hrs)	Duration of estrus (hrs)	Intensity of estrus (Percentage)		
				Intense	Intermediate	Weak
I	PGF _{2α} alone	70.20±0.87 ^b	30.60±1.30 ^b	20	60	20
II	PGF _{2α} +GnRH (48 h after PGF _{2α})	60.20±1.41 ^a	21.80±0.80 ^a	20	40	40
III	PGF _{2α} +GnRH (72 h after PGF _{2α})	69.60±1.19 ^b	26.30±0.76 ^b	40	50	10
IV	PGF _{2α} +GnRH (5 th day after AI)	70.90±1.12 ^b	30.20±1.32 ^b	20	50	30

Means bearing different superscript (a-b) in each column differ significantly (P<0.01)

The overall time taken for the onset of estrus presented in Table 1. The results were in agreement with the observations of Sahatpure and Patil (2008) and Patil and Pawshe(2011) and in contrast to the observations of Yoshida *et al.* (2010) who reported that the cows exhibited estrus within 5 days after administration of PGF_{2α} intramuscularly. Following administration of PGF_{2α} after the mid-static phase of the dominant follicle (late plateau), the next wave will grow and become the ovulatory follicle resulting in a longer interval from treatment to ovulation (Kastelic *et al.*, 1990). The time taken for the onset of estrus in group II treated with GnRH 48h following PGF_{2α} was shorter (P<0.01) than the other groups and this might be due

to the early and premature development of follicles resulting in the surge like increase in LH and FSH.

The time taken for the onset of estrus and duration of estrus in group II was shorter (P<0.01) than the other groups (Table I), which was in agreement to that of Yoshida *et al.* (2010) who demonstrated that the administration of GnRH after a luteolytic dose of PGF_{2α} shortened the duration of estrus when compared to control heifers. This might be due to the additional preovulatory injection of GnRH 48 to 60 h after PGF_{2α} administration which in turn reduced both the time of ovulation and the duration of estrus.

The incidence of weak estrus was significantly higher and the intense and intermediate estrus was significantly lower in group II when compared with other groups (Table I), which was in agreement to that of Teponen *et al.* (2002) who reported that the cloprostenol treatment on day 8 had no effect on the intensity of the estrous signs. Instead, GnRH treatment 24 h after PGF_{2α} treatment weakened the estrous signs significantly ($P < 0.01$). These results might be due to the exogenous administration of GnRH before the endogenous release of LH which depressed the estradiol level. Further, the incidence of intense and intermediate estrus in the present study was significantly higher and the weak estrus was significantly lower in group III when compared with the remaining groups. These results indicate that the administration of GnRH at the time of insemination favours greater development of graafian follicle and thus probably increase the estrogen concentration and decrease the progesterone concentration.

The serum progesterone concentration did not differ significantly ($P > 0.05$) between groups on day 0. But the serum progesterone concentration was significantly higher ($P < 0.05$) in group II at 72 h after PGF_{2α} injection which might be due to incomplete luteolysis and the subsequent rate of progesterone decrease is likely to be low and the duration of estrus is extended (Savio *et al.*, 1990). In the present study, the duration of estrus was shorter than the other groups which might be due to the premature ovulation of a dominant follicle with GnRH reduced size of the ovulatory follicle, reduced fertility and decreased subsequent luteal function (Mussard *et al.*, 2007). In group III on day 5, and group IV on day 10 and 16 post-insemination progesterone concentration was significantly higher ($P < 0.05$) than the other groups, which might have acted to enhance or alter theca-lutein or granulosa-lutein differentiation in the post ovulatory follicle or developing corpus luteum to promote the conversion of progesterone (Rajamahendran *et al.*, 1998).

The group IV had significantly longer estrous cycle length ($P < 0.01$) than the other groups. The administration of GnRH agonist at the onset of estrus

was associated with the development of more functional corpus luteum which increased the luteal phase progesterone concentration and maintained beyond the normal duration (Schmitt *et al.*, 1996).

The first service conception rate was higher in the group treated with GnRH at 72 h following PGF_{2α} injection than the other groups. The higher response in the present study, with the administration of GnRH at the time of insemination might have a greater value in correcting delayed ovulation and ensuring better first service conception rate in crossbred cows (Iyer and Srikumaran, 1992). The second service and overall conception rate in the present study was higher in the group treated with GnRH on day 5 post-insemination following PGF_{2α} injection. The underlying mechanism that may be responsible for the reduction in conception rate include reduced preovulatory estradiol concentration, incompetence of the oocyte, diminished oviductal function and sperm transport, an improper uterine environment and impaired luteal function and combination of these factors (Mussard *et al.*, 2007).

It can be inferred from the study that 25 mg of PGF_{2α} administered intramuscularly on day 10 of the mid-luteal phase was found to be very effective in bringing a complete luteolysis. But, PGF_{2α} synchronized estrus combined with GnRH on day 5 post-insemination or at the time of insemination found to have achieved fairly a good conception rate when compared to PGF_{2α} alone or GnRH administered 48 hrs following PGF_{2α} in repeat breeder cows.

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REFERENCES

- Iyer, C.P.N and Srikumaran, T. (1992). Clinical trials with receptal for treatment of delayed ovulation in crossbred cows. *Indian J. Anim. Reprod.*, **13**:88-89.
- Kastelic, J.P., Knopf, K and Ginther, O.J. (1990). Effect of PGF_{2α} treatment on selection and development of

- the ovulatory follicle in heifers. *Anim. Reprod. Sci.*, **23**:169-180
- Maurer, R.R and Echternkamp, S.E. (1985). Repeat breeder females in beef cattle: Influences and causes. *J. Anim. Sci.*, **61**:624-636.
- Mussard, M.L., Burke, C.R., Behlke, E.J., Gasser, C.L., and Day M.L. (2007). Influence of premature induction of a luteinizing hormone surge with gonadotrophin-releasing hormone on ovulation, luteal function and fertility in cattle. *J. Anim. Sci.*, **85**:937-943.
- Patil, S.R. and Pawshe, C.H. (2011). Estrus induction and fertility following single dose of PGF_{2α} in crossbred cows and heifers. *Indian J. Anim. Reprod.*, **32**:61-62
- Effects of buserelin injection and deslorelin (GnRH-agonist) implants of plasma progesterone, LH, accessory corpus luteum formation, follicle and corpus luteum dynamics in Holstein cows. *Theriogenology*, **50**:1141-1155.
- Rentfrow, L.R., Randel, R.D and Neuendorff, W.A. (1987). Effect of estrus synchronization with SMB on serum LH, progesterone and conception rate in Brahman heifers. *Theriogenology*, **28**:355-362.
- Sahatpure, S.K., and Patil, M.S. (2008). Synchronization of estrus with PGF_{2α} analogue in non-descript cow. *Veterinary World*, **1**:203-204.
- Savio, J.D., Boland, M.P., Hynes, N., Mattiacci, M.R. and Roche, J.F. (1990). With the first dominant follicle of the oestrous cycle of heifers ovulate following luteolysis on day 7?. *Theriogenology*, **33**:677-687.
- Schmitt, E.J.P., Diaz, T., Barros, C.M., De la Sota, R.L., Drost, M., Feedriksson, E.W., Staples, C.R., Thorner, R and Thatcher, W.W. (1996). Differential response of the luteal phase and fertility in cattle following ovulation of the first wave follicle with hCG or an agonist of GnRH. *J. Anim. Sci.*, **74**:1074-1083.
- Sharma, R.N., Singh, B.K and Sharma, M.P. (1988). Bacteriological studies on the cervical mucus of repeat breeding crossbred cattle, their treatment and conception rate. *Indian J. Anim. Reprod.*, **9**:105-109.
- Snedecor, G.W and Cochran, W.G. (1989). *Statistical methods*, 8th edn. Iowa State University Press. Ames, Iowa.
- Taponen, J., Kulcsár, M., Katila, T., Kátai, L., Huszenicza, G and Rodríguez-Martínez H (2002). Short estrous cycles and estrous signs after premature ovulations induced with cloprostenol and gonadotropin-releasing hormone in cyclic dairy cows. *Theriogenology*, **58**:1291-302.
- Yosida, C., Yusuf, M and Nakao, T. (2009). Duration of estrus induced after GnRH-PGF_{2α} protocol in dairy heifer. *J. Anim. Sci.*, **86**:649-54.

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